SCIENCE

FRIDAY, SEPTEMBER 23, 1887.

THE UNITED STATES HYDROGRAPHIC OFFICE has already received about three hundred reports from vessels which encountered the violent hurricanes which swept the Atlantic during the last two weeks of August and the first week of the present month. Many vessels which were in the greatest danger attribute their safety to the use of oil in the manner so persistently urged by Commander Bartlett in various editions of the 'Pilot Chart of the North Atlantic Ocean,' and such incidents will be among the most interesting facts brought out by the published report. Were it not for the conclusive testimony received from masters of vessels of all kinds, from the little fishing-schooner to the great transatlantic liner, the idea that a vessel could escape shipwreck in a hurricane by allowing a few gallons of oil to trickle overboard would be regarded as worthy of Baron Munchausen; but "truth is stranger than fiction." These hurricanes seem to have moved along the usual parabolic track, with the vertex of the curve off Hatteras and the upper branch stretching across the Atlantic towards the British Isles. Every effort is being made to collect full reports from vessels as soon as they reach port, and to compare their barometers with standards at the branch hydrographic offices. One vessel reports a barometer reading as low as 27 inches; but it was an aneroid barometer, and the reading was not recorded at the time. The most reliable report thus far received makes the lowest reading 27.91 (aneroid compared with standard, and reading corrected), on board the American steamship 'El Dorado,' Aug. 23, 4 P.M., in latitude 29° north, longitude 78° west (about 140 miles east-north-east from Cape Canaveral). With our present knowledge of the character and usual path of these terrific cyclones, and the destruction wrought in their track along our coast, on the fishing-banks, and along the great highway of transatlantic travel, it seems almost criminal carelessness for Congress not to allow greater use to be made of the telegraph cable through the West Indies and Windward Islands, by means of which several days' warning of their approach could generally be obtained, and an accurate forecast published for the benefit of commerce. The completion of the report now in preparation will be looked forward to with interest not only by mariners, but by the public generally.

THE INTERNATIONAL MEDICAL CONGRESS.

THE variety of subjects discussed in the section of special and general medicine at the recent International Medical Congress was very great. Many of the papers read were of purely professional interest, and not such as to be of any value to our readers: others, on the contrary, were of general interest, and, although read and discussed by medical men alone, still they contained much of instruction for all thoughtful minds. We shall endeavor to give a brief *résumé* of those which seem to us of greatest importance.

Dr. William Welch read a paper on vaccination during the incubation period of small-pox. His experience in one hundred and forty-four cases has been such as to prove that vaccination at this time will either prevent the attack of small-pox or so modify it as to insure the recovery of the patient. The discussion which followed brought out the statement from Dr. Parker of England, that in the large cities of that country human lymph was generally employed. Parents are required to bring their children at certain times to public stations for vaccination. Although revaccination is performed upon school-children at the age of fourteen years, this is not compulsory.

A paper on the pathogenesis of yellow-fever was read by Dr. Alvara of Mexico, in which he expressed the opinion that yellow-fever is an auto-blood-poisoning, either by the acid phosphate of soda of the same blood or by the phospho-glyceric acid set free from the lecithina as a result of the action of microbes on the blood.

Dr. Lester of Missouri regards pneumonia as an infectious disease, influenced by malaria and improper hygienic surroundings. Dr. Didamore of Syracuse referred to the discovery of the micrococcus of pneumonia and to the experiments which showed that when this is inoculated pneumonia will result.

Dr. Gihon, United States Navy, read a paper on the domain of climatology and demography as dependencies of medicine. He claimed a place for climatology as one of the sisterhood of medical sciences. Climatology and demography are contributory sciences to preventive medicine, and this is more important than curative medicine. The diseases which are truly climatic are but few. Malaria is not one of these. The reduction of the death-rate of the Italian army to one-third what it formerly was, is due to the drainage of the Roman marshes. Local unsanitary conditions cause more disease than the climate. He criticised vital statistics as usually prepared and published, stating that more facts are needed than the simple number of births, deaths, and marriages. Records, if they are to be accurate and of value, must not be voluntary, but under governmental direction.

Dr. Rohé of Baltimore, in a paper on the meteorological elements of climate and their effects upon the human organism, said that climatologists do not at the present time believe that ozone has any influence either in preventing or causing disease. Some believe that peroxide of hydrogen is an important antiseptic element in the atmosphere, but further investigation in this direction is needed.

Dr. Parker of Newport spoke of a number of health-resorts which he regarded as adapted for the stay of the sick. He recommended a wagon-trip across the plains as one of the best means of obtaining the advantages of a health-resort.

Dr. Taylor, United States Army, presented a paper on the necessity for a more careful examination of the water-supply of military posts, where an unusual amount of sickness prevails, and examination of hygienic surroundings. At some of the military posts the death-rate is great, owing to enteric and malarial fevers, which would be much reduced if proper attention were paid to the water-supply and to the general sanitation of these posts. Dr. Marston of England had no doubt but that certain epidemics of disease which he had observed among soldiers, were caused by impure water. While malaria might be in some instances due to the same cause, the influence of freshly disturbed soil was a most important one. It was believed in China that the simple scratching of the soil by chickens resulted in the production of malaria in those persons who lived near by. He had also witnessed an epidemic of goitre, which was directly traced to the use of drinking-water which contained lime salts.

Dr. Thomas of Baltimore read a paper on the causes of so-called hay-fever. The exciting causes he classified as follows: 1. Inert substances floating in air, dust, pollen, etc.; 2. Psychical impressions; 3. Meteorological changes, sunlight, wind, etc.; 4. Morbid changes or growths; 5. Irritation reflected from distant parts of the body. In speaking of the treatment, he said that the use of cocaine gives temporary relief, but there is danger to tissues from protracted use.

Dr. Collins of Philadelphia described the construction of field-hospitals, mentioning more particularly the depot field-hospital of the army of the Potomac at City Point, Va., in 1864–65. This hospital occupied two hundred acres of land, and could accommodate ten thousand patients. During the war, 71,223 soldiers were treated there. Dr. Varian of Titusville, Penn., recommended tents for hos-

pital purposes, stating that the liability to enteric fever and other camp diseases was much lessened when the sick were under canvas. The streets between hospital-tents should be at least fifty

Fig. 1.

feet in width; and when it was necessary to heat the tents, as in winter, open fires in front of them gave the best results.

The following resolutions were adopted by the section of climatology and demography: —

"*Resolved*, That in the opinion of the section on medical climatology and demography, of the Ninth International Medical Congress, assembled in the city of Washington, Sept. 5–10, 1887, it is important there should be established in every country a national department, bureau, or commission for the record of vital statistics upon a uniform basis, to include not only accurate returns of births and deaths, but the results of collective investigation by government officials, of facts bearing upon the natural history of disease as manifested among men, women, and children separately, especially with regard to climatic and other discoverable causes of the several forms of disease, — race, occupation, and residence being included, — that necessary preventive measures may be determined and enforced for the preservation of the public health."

Dr. Denison of Colorado read a paper on the preferable climate for phthisis, illustrated copiously with maps and tables. He believes that climate is to be preferred for the greater number of consumptives in the United States which is between fifteen hundred feet elevation in the North in winter, and ten thousand feet in the South in summer.

Dr. Day of Louisiana presented a report which was the result of an inquiry into the facts relating to the effects of overflow of the Mississippi River, and based on communications from five hundred physicians of the South. His deductions are, (1) that overflows are injurious to the public health; (2) that their evil effects upon health are lessened or entirely antagonized by good natural or artificial drainage, and by copious showers of rain occurring during the period of subsidence of the waters; (3) that rice-culture is inimical to health only by reason of the improper and unsanitary manner of its cultivation.

Dr. Semmola of Naples delivered an address on bacteriology and its therapeutic relations. He regards the tendency to consider bacteriology as the key to all pathology to be a great mistake. Microbes are not always the cause, but are often the effects of disease. Before any microbe is to be regarded as the cause of a given disease, we ought to reproduce that disease artificially by that microbe. The experiments made have not given any satisfactory results, except in carbuncle and tuberculosis. To conclude hastily that a given microbe is the cause of any disease is to ignore the experimental method. In the present condition of bacteriology it cannot be taken as a guide for the treatment of internal diseases. Modern bacteriology may lead the way to the most fruitful field of inquiry in the future, but for the present it has produced no practical results in the cure of internal diseases. It has not yet been demonstrated in what measure microbes are the causes of diseases. In future investigations preconceived ideas must be abandoned, and scientific independence must be preserved.

Dr. Freire of Brazil read a paper on vaccination in yellow-fever, in which he renewed his claim to the discovery of a method by which yellow-fever may be prevented. He also exhibited specimens of the yellow-fever microbe. In families consisting of a considerable number of persons, if vaccination was practised after the outbreak of the fever, its progress in that family was arrested; if not practised, all would be stricken down, and a large proportion, if not all, would die.

In addition to these papers, of which we have been able to give only the briefest *résumé*, a large number of others were presented to the congress, which were of great value and importance, and from which we shall hope to make extracts hereafter.

SOME WESTERN MUMMIES.

Early in the present year a party of prospectors were searching for precious metals and old Spanish mines in the wild regions of

Fig. 2.

Arizona and New Mexico. They happened to win the confidence of an Indian chief by curing his sick daughter, who had been given up by the medicine-man; and he offered to show them a wonderful cave, where it was supposed that gold bars and immense riches

were hidden. But the cave was sealed up with adobe cement, and the Indians had never attempted to open it. The situation of this cave, which the miners at once turned to visit, is described as being

FIG. 3.

on the west side of the cañon of the Gila River, near the bend where it flows westward into Arizona. On opening the cave, they found a number of human bodies.

After this discovery, they proceeded more cautiously. The cave was found to be a natural sepulchre, not fashioned by the hands of man, about twenty-five feet in diameter, and covered with a peculiar dry dust. Along its irregular sides and roof, not a trace of any pictographs could be found; but near the entrance one body, and at the far end four others, were discovered, and all in a wonderful state of preservation. The bodies were wrapped in cloths of peculiar workmanship, some rich in texture.

The shrouds enveloping the bodies crumbled to dust at the slightest touch, as would a piece of burned linen or paper; and only three samples were saved, — one a coarse cloth, a sort of cordage; another similar but finer; and the third of a finer thread texture.

After carefully searching the cavern, and having fully satisfied themselves that its richness was all a superstitious legend, the miners prepared to convey the mummified remains to civilization. Much difficulty and many hardships were encountered during this undertaking. The Indians of that district have the greatest superstitious veneration for the burying-places of the prehistoric races, amounting in some cases to actual worship; looking upon the dead bodies as departed gods, so do they reverence the mounds and ruins in that locality. The Indians, therefore, protested against the removal of the remains; and it was only through diplomacy, bribery, and strategy that we have the bodies here to-day.

A careful examination of these remains leaves no doubt as to their genuineness. They are desiccated human bodies, wonderfully well preserved when we consider their probable age and the fact that I do not find any trace of any embalming process having been used. They are consequently nothing like the Egyptian mummies. The viscera, brain, and every thing is in its proper or normal anatomical position. Even the sexes can readily be distinguished. The skin is like dried leather or thick parchment. The hair is well preserved on the heads and on the eyebrows of Fig. 1, and on the pubes. The teeth, nails, cartilages of the ears and nose, are in good condition, and the nipples and mammæ in Fig. 4.

It is barely possible that the burying-shrouds may have been impregnated with some preservative chemicals or herbs, although hardly probable, as these cloths crumbled to dust on exposure. The only reasonable explanation is, that the hot dry air of this region absorbed all the moisture in the bodies, and literally dried them up, skin, muscles, and viscera. The Indians on this coast dry their buffalo and bear meat in a similar manner in the summer for food in the winter.

Fig. 1 represents the first body, found sitting in the same attitude at the entrance of the family sepulchre, face towards the east. It is a male body, and the giant of the whole group. His stature is the largest, and will measure five feet six or seven. The frame is well proportioned. The skin has a dirty grayish appearance, parchment-like to the touch, and closely adherent to the bones. He has a luxurious growth of black and rather coarse hair. The eyebrows are jet-black, and stiff like bristles. Very few hairs can be discovered on the face. The forehead is well developed; head measures twenty and one-half inches in circumference. The hands and feet are shapely. The dark lines circumscribing the extremities in this and the following figures are cords, with which they are retained in their original positions, and bound to the cases in which they are packed.

Fig. 2 shows the mortal remains of an elder male, not quite as tall, nor with as large a frame, measuring about five feet three. He was found sitting in his present posture between the other two bodies, at the far end of the cave. The teeth are well preserved, and the tongue is like a dried piece of bark. The cloth surrounding his extremities is a heavy fabric, through which is woven a yellowish thread. The small piece of cloth adherent to the tibio-femoral articulation is the only part of the finer shrouds that was saved.

Fig. 3 portrays the mother and the child (a little girl about four years of age). The babe was found as depicted, nestled closely to its mother's breast. This group attracts much attention. They

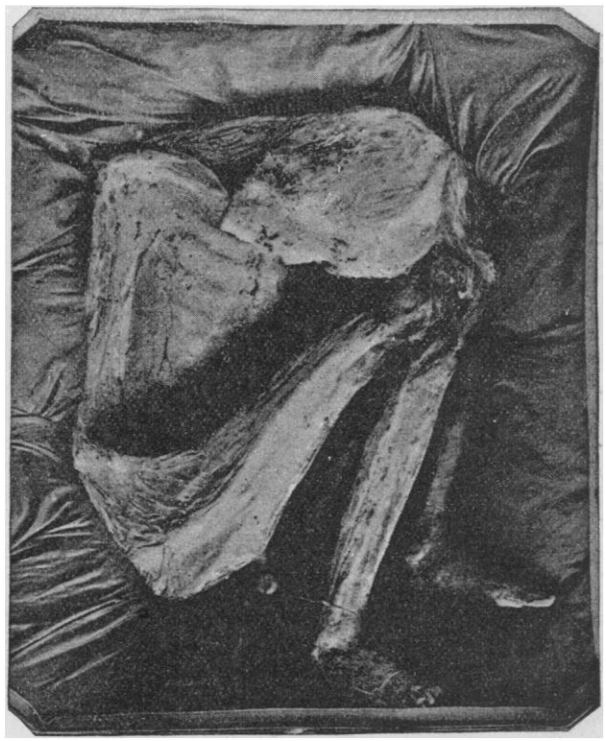


FIG. 4.

are the best preserved bodies in the whole group. The large figure is that of a woman about five feet tall, small hands and feet, and well-proportioned features. The child is well formed, has evidently walked, and reached about four years. Coarsely woven fabric

shrouds the lower limbs of the mother. It is of the same general characteristics as that covering the body in Fig. 1.

Fig. 4 represents the body of a younger woman, although less perfectly preserved. She has small delicate features, very small hands and feet, and the instep is highly arched. On part of the head is found long, fine black-brown hair. It comes off readily, half of it having already fallen out. From the appearance of the mammæ and nipples, I should say she had born children. The pelvis is large and well formed.

The cranial, throacic, abdominal, and pelvic viscera have not been disturbed in any case. No violence has caused death; and why these five remains of ancient civilization should have been placed side by side in a stone sarcophagus, five thousand feet up in a cave, must remain a matter of speculation for the present. Perhaps they all belonged to one family, — father, mother, and child, with husband and daughter or son and wife.

The heads are well shaped. The measurements of their skulls would place them among the meso-cephalic, or intermediate between the dolicho- and brachy-cephalic. The face is oval, high cheek-bones, long eyes sloping outwards, the fleshy lips and nose rather flat and wide. In my judgment, these are bodies belonging to a period not less than four or five hundred years ago. The owner of these bodies, Mr. Joel Docking of San Francisco, is going to place them in one of the large museums of the world.

WINSLOW ANDERSON, M.D.

EXPLORATION AND TRAVEL.

New Guinea.

SINCE the Germans have taken possession of the eastern part of the north coast of New Guinea, and the island has been divided by treaties among the Dutch, English, and Germans, explorations are carried on very vigorously. It is only a few years since d'Albertis discovered the upper part of the Fly River, and thus was the first to enter the interior of the large island for a considerable distance. Since that time English missionaries have been very active in the exploration of the south coast. Of prime importance is the work of Rev. J. Chalmers, who knows the natives probably better than any other white man. His remarks on the distribution of a light and a dark colored population of New Guinea, the former of whom he considers Malayans, the latter Papuans, are of great interest. He states that the former, on their migration from the north-west, located between the Papuan aborigines (*Proc. Roy. Geogr. Soc.*, 1887).

The Australian colonies take a particular interest in the exploration of the island, as they are watching with jealousy the attempts of the French and Germans to gain a foothold in the Pacific Ocean. Since the close of 1885 they have equipped several expeditions, but so far they have not been very successful. In 1885 the small steamer 'Bonito' was sent out to explore the high mountain-ranges in which the Fly River has its source; but this attempt failed, as the steamer was in the hands of an unskilled captain. The only geographical result was the exploration of a small tributary of the Fly River, though the cost of this expedition was about eighteen thousand dollars.

In 1886 the well-known traveller H. O. Forbes set out to explore the Owen Stanley Mountains in the south-eastern part of New Guinea; but unfortunately he arrived on the island in the rainy season, when travelling is impossible, and later on he had to give up his intention on account of lack of means. The project has, however, been taken up again, and Mr. Vogan, the curator of the Auckland Museum, and Mr. Cuthbertson, are about to start on a journey from the south coast to Huon Bay.

Besides these attempts, which have so far had no important results, a great number of successful explorations have been carried out. The *Deutsche Kolonialzeitung* reports that a private expedition was sent by a Sydney house to the Gulf of Papua. The steamer 'Victory' reached Aird River at the northern extremity of the Gulf on March 21, 1887, and ascended the river for eighty miles. Its delta is very extensive, and was partly explored by the steamer. The river was called Douglas River. The 'Victory' returned and discovered another large river near Bald Head. It received the name of Jubilee River, and was found navigable for one hundred and ten miles. Even at this point it was three hundred yards wide and from two to five fathoms deep. Unfortunately no map of this survey has been published so far, and therefore these discoveries could not be inserted in our sketch-map.

New discoveries in the region of Baxter River were made by J. Strachan, who explored part of the river-branches forming the delta of Fly and Baxter Rivers. The same traveller has been exploring the southern coast of Dutch New Guinea, and reports the discovery of a narrow channel leading from McClure Gulf to Geelvink Bay; but Mr. Wichmann remarks justly in *Petermann's Mitteilungen*, that the correctness of this discovery must be doubted, as A. B. Meyer, who travelled over the isthmus, states expressly that there is no connection between the bays.

The best surveys made in New Guinea during the last years are those of the officers of the New Guinea Company and of German men-of-war visiting these coasts. In these parts of our map will be found the most important and most extensive alterations, as compared to former maps. The coast from Humboldt Bay to the southern boundary has been resurveyed for the greater part, and the results have been published by the New Guinea Company (in *Nachrichten über Kaiser Wilhelms-Land*). From these publications we have taken the course of Augusta River and the coast-line. South of Cape della Torre another river was discovered which was called Ottilie River, but it could not be followed to any distance on account of its shallowness: it carries a great volume of water, and may be ascended by a steamer of three or four feet gauge. The course of these rivers shows that the high part of New Guinea is formed by a narrow range of mountains which begins at Geelvink Bay and continues throughout the island to its south-eastern point. The banks of the rivers are inhabited by natives, large villages being found on their upper parts. It will be of great interest to learn where the large river emptying itself at Point D'Urville has its source. So far, the rivers have been the only means of penetrating into the interior, for the vegetation is so dense that it prevents extensive journeys. The map shows that the outlines of many islands are still unknown, and we must add that the positions of the small islands and reefs are uncertain.

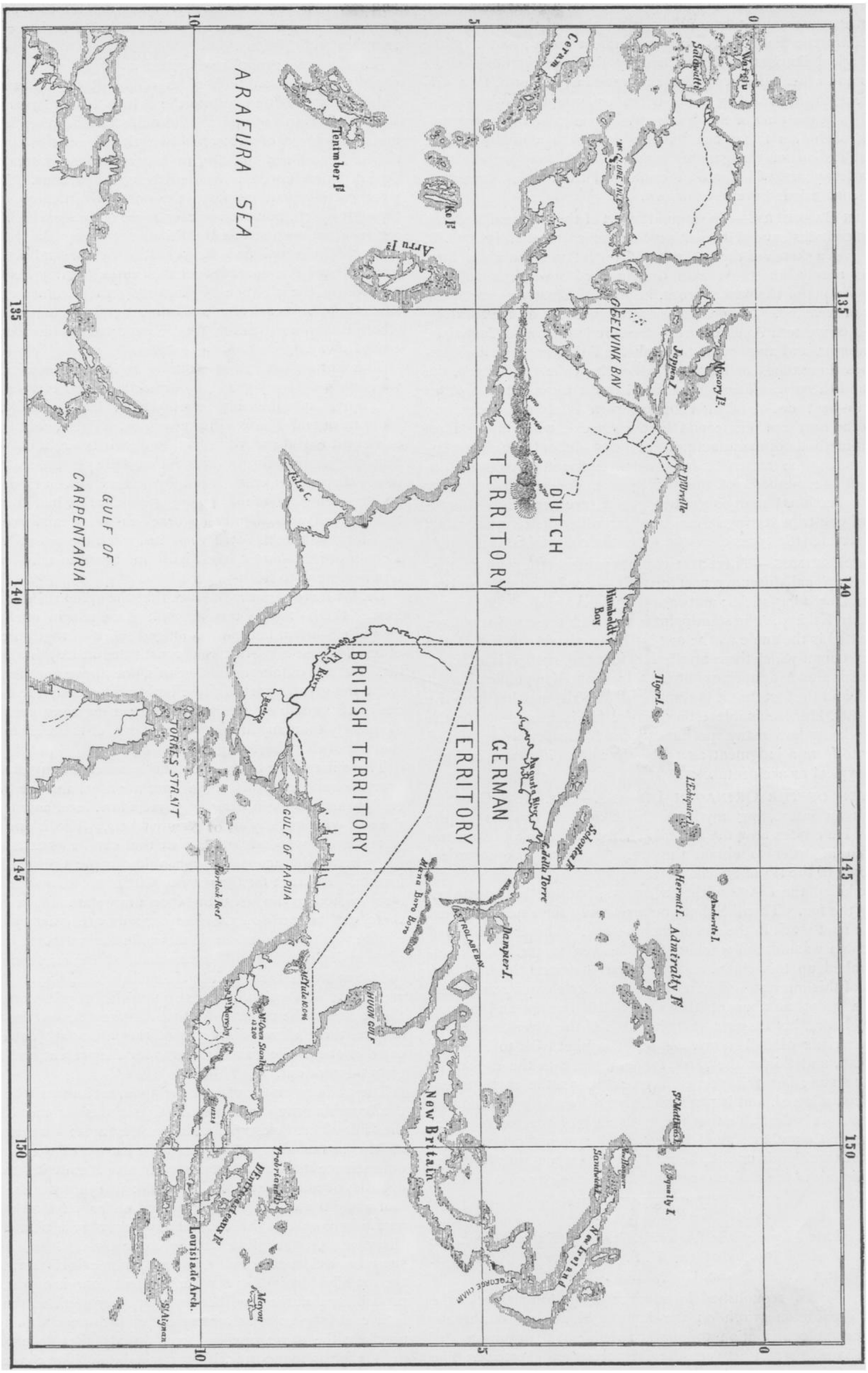
A great difficulty in all enterprises on New Guinea is occasioned by the hostility of the natives. In some parts the English missionaries have succeeded in gaining their confidence, particularly by the help of Polynesian teachers, but generally the natives are distrustful and aggressive. The same is true in New Ireland and New Britain; but it is hoped that in course of time better relations will be established. Recently natives of New Guinea and New Britain have begun to work on the plantations of the companies. The climate of the island is in most parts unhealthy, particularly in the swampy alluvial districts, which are very fertile. It may be, however, that it will become more healthful when the woods are cleared and the swamps drained, as was the case in northern Queensland.

ETHNOLOGY.

Mound-Exploration.

THE second bulletin of the Bureau of Ethnology is a statement by Mr. Cyrus Thomas, who is in charge of the archæological division of the bureau, on the methods adopted for carrying on mound-exploration, and on the present state of the work of the division. His method of investigation is to mark out the several archæological districts by searching for typical forms of remains in the different parts of the country. For the present the field of researches is limited to the district east of the Rocky Mountains. Three north and south lines were worked: the first and principal one, the immediate valley of the Mississippi from Wisconsin southward; the second, from Ohio southward through Kentucky to Mississippi; and the third, in the valley of eastern Tennessee and western North Carolina, thence southward through Georgia and Alabama to Florida. Sections which had been somewhat carefully worked over were generally passed by. The specimens found by the exploring parties are handed over to the National Museum.

Among the results so far obtained, the most important ones are mentioned in the bulletin. The links discovered directly connecting the Indians and mound-builders are so numerous and well established that there should be no longer any hesitancy in accepting the theory



SKETCH-MAP SHOWING RECENT EXPLORATIONS IN NEW GUINEA.

that the two are one and the same people; that a great number of these ancient monuments were built at the time of the discovery of America by the Europeans and subsequent to it; and that the archæological districts, as determined by the investigations of the mounds and other ancient works and remains, conform, to a certain extent, to the localities of the tribes or groups of cognate Indian tribes at the time of the discovery. Conclusions on early migrations of Indian tribes can only be drawn to a limited extent. The publication of the general report, which may be expected within a few years, will contain the material from which these important conclusions have been drawn.

INDIAN BASKETRY.—The annual report of the National Museum for 1884 contains several interesting ethnological papers. Prof. O. T. Mason gives a sketch of the basketry of North American aborigines, which is amply illustrated with drawings of specimens and enlarged portions of the basket-work, in order to illustrate exactly the manner of weaving. Mason discusses the methods in use all along the coast of western America from the Arctic Ocean to California, in the interior, and among the tribes of the Atlantic coast, and distinguishes three types of basketry, which he calls the twined, the coiled, and the woven ones. The first is most frequently found on the north-west coast. Coiled basket-work is almost exclusively used by the northern Tinne and by the Apache, while many tribes apply all methods of manufacture. A great difficulty in determining the areas of characteristic forms is encountered through the deficiency of the methods of many collectors, and the fragmentary state of collections; many specimens which are seemingly characteristic of one tribe having in reality a far wider distribution, while other characteristic types are wanting in the collections.

OF THE ESKIMOS.—There are two other papers of the same character in the National Museum report for 1884,— one by the same author, on Eskimo throwing-sticks; and one by Mr. John Murdoch, on bows of the western Eskimo. The standpoint from which these subjects have been treated is the same as the one indicated above. A list of the specimens upon which these studies are founded, such as is attached to Professor Mason's paper, ought not to be omitted in publications of this kind, and the fact that it is wanting detracts somewhat from the value of Mr. Murdoch's interesting paper. It is necessary for the reader to know how many specimens of each locality were studied in order to form a judgment as to how far the difference in form may be typical or accidental.

A MYTH OF THE OKINAGEN INDIANS.—Mr. A. S. Gatschet publishes an interesting myth of the Okinagen Indians in the *Globus*. He relates how the animals climbed on a chain of arrows to heaven in order to obtain the fire. The bird Tskan made a strong bow of the rib of an elk which he killed by eating its heart. Then he killed the *coyote* with his arrows, but the latter was revived by the fox. Then he shot one arrow into the sky. The next arrow he shot stuck in the end of the first one. Thus he continued until a chain was formed reaching from heaven to earth. All animals climbed up this chain, and the beaver obtained the fire. An analysis of this interesting legend shows that its elements are found among a great number of tribes of Selish lineage and among their neighbors, but it seems that the myth of the ascent to heaven is characteristic of Selish mythology. Gatschet tries to interpret this legend, and thinks the bird Tskan represents the moon, the *coyote* the sun; but this seems improbable, as the myth is extremely complicated, and is probably derived from a great number of sources. It is desirable that the mythology of the native tribes of the upper Columbia should be collected systematically, for the analysis of tradition is one of the most important methods of studying the history of the native races and the psychology of nations.

BOOK-REVIEWS.

Synopsis of the Flora of the Laramie Group. (Extract from the Sixth Annual Report of the U. S. Geol. Surv.) By LESTER F. WARD. Washington, Government. 4°.

THIS synopsis is published in advance of the completion of the author's great monograph on the Laramie flora, and is a timely and important contribution to our knowledge of the thousands of feet of debatable strata between the Cretaceous and Tertiary. The literature of the Laramie group is already large and widely scattered, and Mr. Ward has conferred a boon upon future students of this formation by his clear and comprehensive review of previous researches and opinions.

The Laramie group is described as an extensive, brackish-water deposit, situated on both sides of the Rocky Mountains, and extending from Mexico far into the British North American territory, having a breadth of hundreds of miles, and representing some 4,000 feet in thickness of strata. When this deposit was made, an immense inland sea must have existed, whose waters occupied the territory now covered by the Rocky Mountains. These waters were partially cut off from the ocean by intervening land areas, through which, however, one or more outlets existed, communicating with the open sea at that time occupying the territory of the Lower Mississippi and Lower Rio Grande valleys. That this great inland sea spread over this entire territory, is not at all disproved by the absence of Laramie strata from large parts of it, since these parts are situated, in most cases, in mountainous regions where the upper strata might be expected to have been generally eroded away.

This Laramie sea existed during an immense period of time, and was finally but very gradually drained by the elevation of its bed, through nearly the middle of which, longitudinally, the Rocky Mountains and Black Hills now run. The exceeding slowness of this event is shown by the fact, so clearly brought out by Dr. White, that the marine forms of the Fox Hills strata, as they gradually found themselves surrounded by a less and less saline medium on the rising of the intervening land area, had time to become transformed and adapted to brackish-water existence, while these new-formed brackish-water species, when the sea at length became a chain of fresh-water lakes, had time again to take on the characters necessary to fresh-water life.

Dr. White recognizes the fact that the upheaval of the strata that formed the bottom of this sea took place, not in one uniform process of elevation, but in a prolonged series of rhythmic fluctuations of level, whose algebraic sum constituted at length a mountain uplift. But the numerous coal-seams, one above another, that characterize the greater part of these beds, and equally the successive deposits of vegetable remains at different horizons, speak even more eloquently than any animal remains can, of the oscillatory history of the bed of this sheet of water.

There may have been, and doubtless were, many islands scattered over the surface of this sea in Laramie time, and the evidence generally warrants us in assuming that a low, level country surrounded the sea, with marshy and swampy tracts. The islands and shores were heavily wooded with timber that can be as certainly known in its general character as we can know the timber of our present forests. But that for the greater part of the Laramie period there also existed at no great distance a large amount of elevated land, there can be no doubt. The deposits are chiefly siliceous in the southern districts, and argillaceous in the northern, but the nature of their deposition points unmistakably to the existence of large and turbulent rivers, that fell into the quiet sea and brought down from areas of rapid erosion immense quantities of silt corresponding to the nature of the country over which they flowed in their course. Where these elevated sources of this abundant detritus were located is one of the great problems for the present and future geologists to work out.

The author points out that the apparent impossibility of referring the Laramie group to either the Cretaceous or the Tertiary is not the fault of the investigators, but of the facts; for the real disagreement is in the organic forms and the nature of the deposits, so that omniscience itself could never harmonize them with the forms and deposits of other parts of the world: in other words, the Laramie fauna and flora have been developed under physical conditions so nearly unique that it is extremely improbable that they obtained elsewhere on the globe at the same time. And even supposing such a coincidence possible, if the Laramie invertebrate forms are the modified descendants of antecedent marine forms, there is no probability that the conditions at any other point on the earth's surface could be so nearly identical with those obtaining there, that precisely the same modifications would take place to adapt the marine forms to the brackish-water habitat. The chances are therefore infinity to one against the existence of other beds that shall

contain an invertebrate fauna identical with that of the Laramie group.

With regard to vertebrate remains, this objection does not apply; and, could they be made to harmonize with themselves, they might, perhaps, be trusted to some extent as indices of synchronism in widely separated localities. But, as shown by Cope, they do not thus agree, for the Laramie forms include genera that are regarded as characteristic of Cretaceous, and others that are regarded as characteristic of Tertiary strata. This should surprise no one. The law that has been laid down by paleontologists, that the same epochs in geologic time produced the same living forms, is contrary to the now well-established principles of geographical distribution, according to which the earth is subdivided into a large number of faunal areas more or less clearly marked off one from another.

The peculiarity of this principle, which is of most importance to paleontology, is that these territorial subdivisions represent faunas not merely different from one another, but showing different degrees of biologic development as development is supposed to have gone on in the animal kingdom. Every one knows that the fauna of Australia belongs to an undeveloped type, being marsupial in aspect so far as its mammals are concerned. The types of South America are lower than those of North America, and the latter lower than those of Asia and Europe. If all the present faunas of the globe were buried under its soil, it is clear that it would not only be impossible to harmonize the deposits of different continents, but that the inference now freely drawn by paleontologists, that the less developed forms demonstrate their existence at earlier epochs, would lead to grave mistakes and be generally false. New Zealand is now in its age of birds, while the Galapagos Islands are still in that of reptiles, or the mesozoic age.

The difficulties in the way of geological synchronism arising from the geographical distribution of organisms are not lessened when we pass from the vertebrate fauna to the flora of the Laramie group; for, taking the present flora of the globe as a criterion, we find that the geographical distribution of plants is more uneven than that of animals. Floral realms are more numerous and distinct than faunal realms; and the more serious obstacle, that some areas furnish types representing less developed floras than others, exists here, as in the case of animals. The proteaceous and myrtaceous flora of Australia may be regarded as rudely corresponding to its marsupial fauna. Hence, although the vegetable fossils of the Laramie group are especially remarkable for their great abundance and variety, Mr. Ward concedes that the age of the Laramie group cannot be proved by its flora alone.

The more particular comparison and discussion of the Upper Cretaceous or Senonian, Laramie, and Eocene floras is introduced by a table covering 72 pages, and giving the geographical and stratigraphical distribution of every authentic species from these formations. The discussion concludes with the statement that the Laramie flora as closely resembles the Senonian flora as it does either the Eocene or the Miocene flora. But this does not necessarily prove either the Cretaceous age of the Laramie group or its simultaneous deposit with any of the Upper Cretaceous beds. The laws of variation and geographical distribution forbid us to make any such sweeping deductions. With regard to the first point, it is wholly immaterial whether we call the Laramie Cretaceous or Tertiary, so long as we correctly understand its relations to the beds below and above it. We know that the strata immediately beneath are recognized Upper Cretaceous, and we equally know that the strata above are recognized Lower Tertiary. Whether this great intermediate deposit be known as Cretaceous or Tertiary is therefore merely a question of a name, and its decision one way or another cannot advance our knowledge in the least.

The synopsis concludes with notes on the various localities where the Laramie plants were collected, and 35 double plates, with 139 figures.

Types of the Laramie Flora. (U.S. Geol. Surv., Bull. No. 37.) By LESTER F. WARD. Washington, Government. 8°.

THIS rather bulky bulletin is supplementary to the preceding synopsis. The 139 figures are reproduced on 57 octavo plates, and are accompanied by critical comments, and descriptions of the new genera and species.

NOTES AND NEWS.

ON Tuesday the 20th, in the presence of the secretary of the navy, the naval committee of the House of Representatives, and many representatives of the army and navy of this and other countries, an exhibition was given in New York Bay of the destructive capabilities of the Zalinski pneumatic dynamite gun. The results of the tests made at the time prove conclusively, that, with the present experimental and necessarily imperfect gun, a shell containing fifty-five pounds of explosive gelatine may be thrown with accuracy a distance of one mile, and exploded at the proper moment for producing the maximum of destructive effect. The target used was the two-masted schooner 'Silliman,' eighty tons' burden, late of the United States Coast Survey, but recently condemned, and reserved to be used in torpedo experimenting. She was anchored 1,980 yards from Fort Lafayette, where the gun was stationed. After two trial-shots with blank cartridges, a loaded shell was fired, which struck the water a few yards short of the target. The explosion threw a column of water nearly a hundred feet into the air, and the concussion jarred the vessel so that the mainmast was broken off a few feet above the deck. The next shot struck the vessel at or below the water-line, with an instantaneously destructive result. The schooner was lifted up, fairly torn apart amidships, and the rails were under water in less than thirty seconds, only the foremast and its standing rigging being left in view. All around this floated small fragments of the schooner. In each of these instances the gelatine was exploded by percussion in this way: a small electric battery was affixed to the side, the only thing lacking to start its operation being moisture. A thin piece of blotting-paper kept this out. When the shell was immersed, the moisture admitted generated sufficient electricity to fire a detonator of fulminate of mercury, which exploded the gelatine.

— R. Nahrwoldt has made a series of experiments on the gradual loss of electricity of electrified bodies (*Naturw. Rundschau*, ii. No. 35). In an essay published in 1878 the author proved that the discharge takes place by means of the particles of dust suspended in the air. These are electrified and then repelled from the electrifying body. The result of these experiments led Lodge and Von Obermayer to their method of clearing rooms from smoke. Later on, it was shown that a wire of platina made red-hot by electricity electrified the surrounding air, although it was almost free of dust. For this reason Nahrwoldt resumed his experiments. He found that electricity was discharged through a point only in dusty air. He made his experiments in an air-tight glass shade the sides of which were covered with a thin layer of glycerine. After the dust was precipitated on the sides of the glass through the action of the electricity, the discharge was very slight. As soon as a wire of platina was electrified, and became red-hot, electricity was again discharged through the point. Nahrwoldt concluded that this was due to particles flying from the red-hot wire. This conclusion was proved to be correct by the occurrence of platina in the deposits on the sides, and by the loss of weight of the wire. These experiments led him to the conclusion that air free of dust cannot be electrified statically.

— We learn that the pecuniary loss attending the publication of the *Zoologischer Jahresbericht* has been so great as to make it necessary henceforth to restrict the scope of the work. Systematics and faunistics are to be excluded. The *Jahresbericht* is published under the able editorial supervision of Dr. Paul Mayer of the Naples Zoölogical Station, and has now reached its eighth year. Four heavy volumes have hitherto been issued each year, giving accurate and comprehensive summaries of all the zoölogical work done during the year under review. The *Jahresbericht* is one of the most difficult, most expensive, and at the same time most valuable, zoölogical serials ever undertaken. About thirty reporters (*Referenten*), distributed among different countries, have been employed in collecting, summarizing, and arranging this vast work. The task has been faithfully and most thoroughly accomplished, and we most earnestly hope that the number of subscribers may be at once increased to an extent that will insure its continuance on the same broad plan that has hitherto been followed. The *Jahresbericht* has become our *vade-mecum*; and we can but regard it as a serious misfortune to have its scope narrowed. Are earnest zoölogists in this country willing to see such a work as this interrupted for

want of proper support? There are probably not more than half a dozen subscribers in this whole country. Let those who appreciate the importance of the work encourage it by giving it a place in their private libraries.

LETTERS TO THE EDITOR.

**** *The attention of scientific men is called to the advantages of the correspondence columns of* SCIENCE *for placing promptly on record brief preliminary notices of their investigations. Twenty copies of the number containing his communication will be furnished free to any correspondent on request.*

The editor will be glad to publish any queries consonant with the character of the journal.

Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Romantic Love and Personal Beauty.

YOUR reviewer has pointed out that the light and flippant character of Mr. Finck's style prevents his book from being taken as a serious contribution to science. He has neglected to show that the unintermitting vulgarity of its tone will cause it to have an exceedingly vicious effect upon society, if it should chance to have any effect at all. Romantic love is one of the few thoroughly beautiful and elevated things that civilization has yet produced. It is such a means of refining and subduing the brute in man, and of bringing him a little nearer to the angels, as is no other emotion which he has yet developed. When a young man and a maiden are in love, they walk in a very heaven, not of happiness only, but of delicacy and purity. The poets and the worthy novelists have invested the subject with a warm glow of high feeling and noble aspiration, and even the unworthy novelists have not dared to drag it wholly in the dust. It has been reserved for a Mr. Finck to write of it in a tone which is not equalled by the commonest and most vulgar of the daily newspapers. It is incomprehensible that a book which is offered to decent people to read should contain such a sentence as this, to take an instance at random: "Has Mr. Spencer ever kissed a girl?" Romantic love is a precious possession which the race has been slow to gain. It is possible that it is like a delicate flower, which cannot be handled by the botanist without losing its beauty and its fragrance. At all events, it is of immense importance, if it is to become the subject of scientific investigation, that it should not be vulgarized and cheapened at the very beginning by such a manner of writing as this.

Mr. Finck's book contains a number of very clever explanations of minor points in biology and psychology. His main theses are not new; and, as Mr. Conn has pointed out, it is premarital courtship, and not love, that he has shown, or that can be shown, to be very modern. His explanations, while they are extremely ingenious, always need to be carefully examined, and are seldom fortified by his reasons. His conception of how delicate a task it is to establish a relation of cause and effect may be gathered from the following passage: "Large numbers of tourists in Switzerland constantly suffer from headache, simply because they fail to have the head at night in the centre of the room, where it ought to be, because the air circulates more freely there than near the walls." His literary style is on no higher level than his taste and his logic. He speaks of "a blue-blooded youth and a ditto maiden," and of "knocking the bottom out of the theory of Alison, Jeffrey and Co." So utterly regardless is he of the common decencies of language, that it is impossible to attribute it to the proof-reader when we find him saying that one thing is the "very antipode" of another.

The second part of Mr. Finck's book is, if possible, worse than the first. His ideal of beauty is as poor and mean as his ideal of romantic love. That kind of beauty which can be heightened by pomades and powders for the complexion, and by surgical appliances for straightening noses, is not the kind which our descendants will strive to perpetuate. There is something peculiarly gross and offensive about all such topics to a right-minded person; and to find them discussed in fullest detail in a book which is expected to influence scientific opinion on a subject of profound importance, is certainly one of the most curious freaks that a non-insane maker of a book has yet been guilty of. Mr. Finck pretends to be an admirer of expression as well as of mere animal beauty. But a fine and noble expression is absolutely incompatible with such absorption in the details of the toilet as he recommends. It is impossible for a girl to practise 'making eyes' before her looking-glass, as he urges her to do, without showing the marks of that vacancy and insipidity by which "the faces of many fair women are utterly spoiled and rendered valueless." He quotes this other fine passage from Ruskin: "There is not any virtue the exercise of which even momentarily will not impress a new fairness upon the features;" but he is of too insensitive a fibre to know that there is also not any vanity or vice that will not in time ruthlessly destroy whatever is admirable in the face of man or woman. H.

[WE think our readers will find the above letter interesting as containing the strongly expressed views of a woman belonging to that class which believe they have discovered worthy substitutes for some of the attractions which have proved successful hitherto in bringing into existence this much-discussed romantic love. — ED.]

Grindelia squarrosa.

A VERY interesting find was made here recently by one of the High School boys, who is making botany a specialty. The 'find' consisted of several specimens of a composite plant unknown here before, but which has been decided by several competent authorities to be *Grindelia squarrosa*, a plant said by Coulter to occur "from the Saskatchewan to Texas, and westward to the Sierra Nevadas."

The three or four specimens were found in a pasture, at some distance from the railroad. How they came there is the question which is puzzling those who have seen them, as their true home is said to be so far to the westward. I have heard that a few specimens were once found in Ottawa in this State, but cannot vouch for the truth of the report. L. N. JOHNSON.

Evanston, Ill., Sept. 14.

The Term 'Topography.'

THE significance of the term 'topography' has undergone a rapid specialization in modern scientific usage that is noteworthy as an indication of the increased attention incidentally given to the study of physical geography. A conspicuous improvement in the methods of geographic teaching in England has been commented on in recent numbers of *Science*, and attributed to a growing recognition of the economic bearing of geographic facts. Mr. Keltie has shown that an entirely novel method of treatment, and a rapid advance, have resulted from this altered attitude. There is, however, tacit admission, to which Mr. Davis calls attention (*Science*, x. No. 240), that the nature of the relations of 'physiography' to human development is but vaguely understood, and that progress is at present retarded by uncertainty of aim. Mr. Davis effectively points out the difficulty: that for teaching-purposes there has not been sufficient inquiry into the principles of geographic evolution, "for topographic development is the key to a real understanding of the forms of the land about us;" that "physiography now is in a low position," and "most immature" as a science in itself. Generalization is as yet difficult, or of questionable profit: "attention should be directed instead to the minute morphology and systematic development of individual topographic forms." Physiography must make the same order of advance that biology has made out of the old natural history, with its aimless catalogues of wonders, and study the "simpler type-forms carefully before attempting to understand the complex associations of forms that make up a country or a continent." Mr. Keltie recognizes that it is "typical aspects of the earth's surface," not "extraordinary features," that will serve the purposes of the new geography; "but," as Mr. Davis points out, "he does not say where we shall find a scientific and sufficient investigation of the forms that are chosen as 'typical aspects.' There is no such investigation. The absence of any thorough and consistent physiographic terminology at once points out the immaturity of this study. . . . 'The Sixth Annual Report of the Geological Survey,' just issued, contains, for example, a number of illustrations that will be seized upon when the proper text-book appears. The choice little woodcuts on p. 229, entitled 'Topographic Old Age' and 'Topographic Youth,' are particularly good, but these terms will certainly be new to most readers." No "scientific and sufficient investigation" of the evolu-

tion of geographic forms has been attempted, and there is no "thorough and consistent physiographic terminology;" but systematic incursions have been made into this field by meteorologists, by engineers, and notably by American geologists. The geologist is not, for example, chemist also, because chemistry aids in geologic investigation, but here, from necessity, the geologist is also physiographer. The effect of this orderly work upon the study of physiography, though in the nature of clearing away outlying obstructions to adjoining interests, is seen in the scientific beginnings of a terminology that may be assembled from the writings of Gilbert, Davis, Chamberlin, and others.

The term 'topography,' it would seem, has, within a few years, been appropriated as a general designation for those superficial forms which have recently received attention as both the product and the promise of so much in geologic evolution. The surveyor made little progress in hill-drawing until it was seen that many obscure geologic facts bore, in surface form, a typical expression that could be readily interpreted. As the director of the Geological Survey said recently, in his testimony before the 'Joint Commission' for the investigation of the scientific bureaus of the government, "the most fundamental connection of geology is with topography, because geology has for its purpose, either directly or remotely, the explanation of topography. . . . All the vigor and energy which are devoted to topography in modern times arise from its geologic relations." To meteorology, and to the broader problems of engineering, surface shape, or surface shaping, also bore complex relations; to engineering it set examples; to meteorology it was a known quantity in an intricate problem; to geology it was the beginning and the end. There were recognized "a topography of the land and a topography of the sea," and, in each, characteristic type-forms, both of erosion and of deposition. The type-forms of erosion were seen to vary with the nature and grouping of materials, so that each class of rocks had its own distinctive topographic expression. The recognition of a 'topography' of coal, and of the allied natural products, in the mining regions of Pennsylvania, is of acknowledged economic importance; and glacial history is traced more successfully through its splendid topographic record than through the composition characteristics of its drift.

Obviously a distinctive term is needed here, in the more discriminative modern geology and allied sciences: from recent inquiry into usage, on this point, I cannot but think that 'topography' has been adopted in this definitely restricted sense, and will hold. For example, in a standard treatise on roads, by Lieutenant-Colonel Gillman of the Engineer Corps, this occurs: "In laying out important roads, and especially in locating streets, in thickly settled districts, it is well to place contour curves upon the map. These curves indicate at once, to the practised eye, the topography of the country which they embrace." Dr. Woeikof, meteorologist and professor of physical geography in the University of St. Petersburg, devotes a chapter in his recent book, 'Die Klimate der Erde,' to the 'Variation of Temperature with Altitude, with Particular Regard to the Effect of Topographic Form on Temperature Changes,' as interpreted in *Science* of the same number with Mr. Davis's letter, cited above. In the newer geological reports abundant instance may be found of this use, for example, here and there: "Change in the character of the rocks produces corresponding change in the topography; the soft mica-schists have been worn by erosion into broad parks and valleys, intervening with rounded peaks and ridges of harder strata;" "the main topographical features of this country are the results of erosion, aided and modified by faults and folds, to which volcanic rocks have added many interesting features, mainly by the resistance which they offer to denudation;" "the contrast of hard and soft has determined the main features of the topography. . . . These have been made to give expression to the main facts of the geologic structure;" "the former [a beach line] crosses the irregularities of the pre-existent topography as a contour, the latter [a fault] as a traverse line . . . a system of shore topography, from which the ancient lake has receded, is immediately exposed to the obliterating influence of land erosion;" "the topography was not too rough on the one hand, nor so low and flat as to be submerged, on the other . . . as the peculiar character of the topography of the moraine varies through a somewhat wide range, and sometimes simulates very closely the surface aspect assumed by other formations, the study of topographical types becomes one of essential importance . . . a topographical species absolutely impossible of formation by drainage agencies." Upon the first appearance of the proof-sheets of the new topographical survey of Massachusetts, a year or more ago, the work was commented on editorially in *Science*, in part as follows: "The curious Hopper of Mount Greylock, with its deep-cut valley, is one of the best marked topographic forms in the State . . . what is now needed is the local examination of minute topographic details so that we may learn to see and appreciate the forms about us at home; and nothing will lead sooner or surer to this long delayed end, than the publication of good topographic maps."

I do not think that the term has acquired this association through exceptional fitness of its own, though small objection can be urged on etymological grounds, but because it was in the field, and out of serious employment. Originally it meant place-description, or, as applied to surveying and maps, simply detail, or the art of portraying it. Early topography was, however, singularly unobservant of surface configuration. When the important bearing of surface expression on geologic problems came to be recognized, related topographic work became more appreciative of this additional feature in place-description. Maps of the novel sort were at once recognized as the only completely topographic maps, and to their distinctive characteristic, finally, the term 'topography' got exclusively to apply.

From this point of view, then, in a map, the expression given to the vertical element, whatever the symbol employed, is 'topography;' the drainage, — stream, pond, or marsh, — the obvious agent, destructive or constructive; and the 'culture,' an incident. The term is still in use in the old sense, among surveyors and engineers; and it may, perhaps, continue so, without confusion, as, in turn, a technical meaning. WILLARD D. JOHNSON.

Templeton, Mass., Sept. 13.

A Living Glacier on Hague's Peak, Colorado.

FOUR years ago, Mr. W. L. Hallett of Colorado Springs, while crossing an ice-field on Hague's Peak, stepped into a crevasse which had been hidden by a thin layer of recent snow, and narrowly escaped a serious accident. The crevasse suggested to him that this snow-field was really a glacier. Since that time the place has been visited by only five or six persons. Among these were Mr. Chapin of Hartford, Conn., a member of the Appalachian Mountain Club, who is said, during last July, to have pronounced the formation to be a true glacier. I have recently examined the region, and the following is a brief statement of the principal facts observed: —

From Long's Peak northward to Hague's Peak is a line of noble mountains thirteen thousand or more feet high. The numerous tributaries of the Big Thompson River take their rise in snow or rather ice fields which are situated in basins or mountain cirques far above timber-line near the summit of the range. The upper parts of the valleys of these streams were all glaciated in ancient times, and are bordered by moraines which in some cases extend down into Estes Park. This region is marked on the maps of Clarence King as having formerly been glaciated, but no moraines are shown on Hayden's large map of Colorado. Several of the ancient glaciers are shown by the moraines to have been more than ten miles long, and some of them were at least fifteen miles. Near the post-office marked Moraine on Hayden's map, the moraines are well developed as ridges having steep slopes on each side. They are from a few feet up to about two hundred feet high, and in places are perched on the mountain-sides five hundred feet or more above the bottom of the valley. Going up these valleys, one sees a succession of terminal moraines, showing that there has been a gradual recession of the ice.

The ice-field on Hague's Peak is in a basin roughly semicircular in shape, situated on the east face of the northern spur of the mountain. The basin is small, — hardly one-fourth of a mile in diameter, — and is at the head of a deep valley which drains east, and then south-east, into the Big Thompson. This valley was once occupied by a large glacier, as shown by moraines, by a number of glacial lakelets in the bottom of the valley, and by moutonned bosses of rock. Just below the ice-field a broad moraine ex-

tends across the whole valley. Having climbed to the top of this huge pile of rather angular blocks, you suddenly discover a small lake between the moraine and the ice. The moraine, in part at least, is the barrier that holds back the water of the lake. Except at the outlet of the lake, this moraine rises above the present level of the ice, — in some places fifty feet or more, — and therefore must have been formed at a time when the ice stood at a much higher level than now. The lake is rather less than one hundred yards in diameter. It is locally known as the Frozen Lake, being covered by a weak, granular sort of ice even in midsummer. Floating on the surface of the lake were several blocks of quite solid ice from six to twenty feet long, and rising from two to twelve inches above the water. These little icebergs have evidently broken off from the thin edge of the glacier, which ends in a small cliff from one to three feet high.

The material of the ice-field, though somewhat granular on the surface, is not a mass of snow, but a clear and compact ice. This was determined by observation at the crevasses, and by cutting into it. The surface is deeply furrowed by rains and the water of the melting ice running down the slopes.

The principal crevasse is curved so as to be nearly parallel with the shore of the lakelet, and is not far from one hundred feet back from it. On the upper side of the crevasse the plane of fracture is nearly at right angles to the surface of the ice, but on the lower side the ice has been tilted over; so that, while the crevasse is about ten feet wide at the surface, it is very narrow at the bottom of the ice. The lower parts of the crevasses were filled with snow and broken icicles, ice stalagmites, etc., so that only from twenty to thirty feet can be seen. How much deeper the crevasses really are, is not known; but, from the size and shape of the ice-field, it does not seem probable that the greatest depth of ice exceeds fifty or seventy-five feet. Above the main crevasse were two others large enough to be seen through the recent snow. The number of crevasses is greatest north of the centre of the glacier, where there is a more direct exposure to the sun.

Standing at the lake, you see the glacier sloping steeply down toward you from the south, the west, and the north, somewhat like the seats in a theatre. This causes the ice at the north end of the glacier to flow south, while at the south end it is flowing in nearly the opposite direction. As a result of this peculiar shape, the glacier is somewhat wider than it is long; but it is not exactly symmetrical. On the north side of the valley the ice reaches about two hundred feet farther down the valley (eastward) than on the south side, and it has also extended a tongue of ice southward across the outlet of the lake, so that the outlet is by a subglacial channel. This tongue of ice is nearly one hundred feet wide, and rises six or eight feet above the lake. Some interesting questions suggest themselves as to the cause of the ice having receded farther on the shady side of the valley, the effects of different exposures to the sun, the relative protection afforded by different-sized moraines, inequality of snowfall on the opposite sides of the valley, etc. The depth of recent snow made it impossible to properly examine beneath the edges of the moraines to determine if there is beneath them any ancient and now quiescent ice. Omitting these more complicated questions, it seems probable that the extension of that tongue of ice across the outlet of the lake is, partly at least, caused by a more rapid rate of flow of the ice on the north side of the valley, where there is a more direct exposure of the sun. The slopes of the ice are everywhere steep. In places they would be considered steep for the roof of a house.

It was of special importance to determine if moraines are now being deposited. I saw no evident moraines and only two small pieces of rock on the ice anywhere. The cliffs around the head of the glacier are nowhere very high, in places rising only a few feet above the ice, and they are surprisingly bare of loose fragments. It is just as if the greater glacier of the past had removed all loose material, and the process of weathering has not yet had time to split up the rock and furnish fresh *débris*. Some of the bowlders in the lake come near the surface, and may be a recent terminal moraine. Perhaps a careful examination when the ice is bare of recent snow may reveal moraines now forming; but, if so, they must be small, since there is so little moraine-stuff being cast upon the ice.

There are several other 'snow-fields' in the vicinity of Long's Peak which show some signs of glacial flow. Stakes ought to be set on the surface of these ice masses (for they are all ice rather than snow), and their motions accurately observed.

The view from Hague's Peak is one of the finest in the Colorado Mountains. A trip to this mountain and its small but interesting glacier will rank well with the ascent of Pike's, Gray's, or Long's Peaks. The height of Hague's Peak, as given by Hayden, is 13,832 feet, only 439 feet lower than Long's Peak. The glacier is approximately in north latitude 40° 28′.

From the name of the discoverer, this is known as the Hallett Glacier.

G. H. STONE.

Colorado Springs, Sept. 13.

Condensed Milk.

A CURSORY examination of several cans of preserved milk, that were offered for sale in this State at a price below the actual cost of manufacture, revealed the fact that much of this milk was of poor quality, while some was unfit for use; hence, in the early part of this year, a thorough investigation was made of all the brands of canned milk on sale, and samples were sent to Prof. H. B. Cornwall, of the John C. Green School of Science, Princeton, for analysis. His report, here printed, is of sufficient importance to warrant its publication in advance of my annual report to the Legislature.

WM. K. NEWTON.

Office of the Dairy Commissioner of New Jersey,
Paterson, N.J., Sept. 17.

DURING the first five months of this year a number of samples of condensed milk were received from the State dairy commissioner, and analyzed by the writer, with the result stated in this paper. All but two were condensed with the addition of cane-sugar. While the milks condensed without sugar may be better for infants and invalids if not kept long in cans, yet they are not certain to remain sound, even in the sealed cans, for any length of time, and are therefore of doubtful value.

The milks preserved with cane-sugar, on the other hand, if carefully prepared, keep well in cans, and do not spoil very rapidly even after the cans are opened, provided the can is kept in a dry place and no water is mixed with it. For use with tea and coffee, and for making puddings, custards, etc., they are an excellent substitute for fresh milk.

The very large amount of cane-sugar necessary to preserve them renders them, however, an unwholesome food for infants, and they can by no means be regarded as a good substitute for fresh milk in this case.

The directions on the cans in general state, that, by adding a certain quantity of water, the condensed milk can be made to resemble cream; by adding more, it becomes the equivalent of milk. This can never be true: cream contains from three to four times as much fat as the average condensed milk, and no dilution with water will make such milk resemble cream except outwardly. It would be well if all makers would follow the course pursued by a few, and, while giving such directions as are necessary in using the milk for making desserts, etc., recommend that the advice of a physician be obtained as to the diet of infants. Condensed milk preserved with sugar can never be a fit food for infants.

In some instances very misleading statements as to the quantity of fresh milk condensed to produce the contents of the preserved milk cans were made. It will be seen that the condensation is very rarely more than threefold, and usually somewhat less.

A well-made condensed milk, with cane-sugar, should show very little if any undissolved sugar, and should be of a nearly white color, having but a faint yellowish tinge. It should have no cheesy taste or smell, and should dissolve readily in about four parts of cold water. Especially should it dissolve without showing separated flocculent particles of caseine or curds.

METHOD OF ANALYSIS.

To insure thorough mixing, the entire contents of the can were emptied into a porcelain vessel and thoroughly stirred; 40 grams of the milk were weighed out and diluted with water to 100 cubic centimetres, so that 5 cubic centimetres of the diluted milk corresponded to 2 grams of the condensed milk.

In the case of sample No. 33, which curdled even when slightly warmed with water, and would not mix well with cold water, the portions needed for each determination were separately weighed out.

Total Solids. — Of the diluted milk a measured volume was diluted again with an equal volume of water, so that 5 cubic centimetres corresponded to 1 gram of the condensed milk, and then 5 cubic centimetres were dried in a flat-bottomed platinum dish (40 millimetres in diameter at the bottom), at first on the water-bath, then in an air-bath at 100° to 105° C., until the loss of weight after drying half an hour was less than 2 milligrams. Comparative experiments showed that under the above conditions the drying was as thorough as if the milk had been first coagulated with acetic acid, while the method was more convenient. At first 2 grams of milk were used, but the result was the same, while the drying was far more tedious.

Duplicate determinations were made. The greatest difference was 0.29 per cent; usually it was much less; occasionally the results were identical.

Ash. — The dried milk was ignited in the same dish at a scarcely visible red heat, until no black carbonaceous portions were left. In one case the chlorine in the ash was determined by Volhard's volumetric method, and found to be 9.52 per cent.

Fat. — Rather thick white filter-paper was thoroughly extracted with ether in a Soxhlet apparatus, and 5 cubic centimetres of the diluted milk (equal to 2 grams of the condensed milk) dropped on a nearly square strip of this paper large enough to conveniently soak up the milk. To avoid the formation of candied spots, the milk was uniformly spread over the paper by brushing with a small, narrow strip of the same sort of paper. After drying in the air, the paper was rolled to a loose cylinder, and dried in an air-bath at 100° C. for about an hour and a half. The fat was then extracted with ether for two hours in a Soxhlet apparatus; and a second extraction was made, lasting from an hour to an hour and a half longer. The second extraction usually yielded less than 4 milligrams more of fat, and often none at all. The fat determination was made in duplicate. The greatest difference was 0.2 per cent; usually only a few hundredths of a per cent.

At first, extraction after drying with sand was employed, but comparative tests showed that the paper method yielded better results in less than half the time.

It is a very difficult matter to extract all of the fat from a dried condensed-milk residue in any other way than by using paper, essentially Adams's method. Blotting-paper would not be as good as the thinner filter-paper, because there is so much cane-sugar present in some of the milks.

Caseine and Albumen. — Ritthausen's method was followed, essentially as described by Dietzsch (*Nährungsmittel und Getränke*, Zurich, 1884); 5 cubic centimetres of the diluted milk, equal to 2 grams of the condensed milk, being further diluted with water to 40 cubic centimetres, and then treated with enough of a solution of copper sulphate (6.35 grams in 100 cubic centimetres of water) to insure quick separation of the coagulated albumen after stirring, 15 drops being added in almost every case. Then enough of a 5-per-cent solution of caustic potash was added to render the mixture nearly neutral to blue litmus-paper; an excess of the potash being avoided, as this would hold some of the caseine in solution and render the filtrate turbid. In most cases 5 drops was found to be a proper quantity. After settling clear, the fluid was decanted into a weighed filter 11 centimetres in diameter, previously dried at 100° C. The precipitate remaining in the beaker was stirred up with 20 to 30 cubic centimetres more of water, and finally the whole of the precipitate was brought on the filter, the washing being continued until 100 cubic centimetres of liquid had passed through the filter. This filtrate was preserved for the milk-sugar determination. The precipitate and filter were weighed together, after drying at 100° C., until the loss of weight after drying half an hour did not exceed 1 milligram. The filter and precipitate were next incinerated in a porcelain crucible, and the weight of the residue deducted from the weight of the dry precipitate: the difference was the weight of the albumen (including caseine) and fat; and after deducting the weight of the fat the percentage of the albumen (caseine) was calculated. S. W. Parr (*Amer. Chem. Journ.*, vii. p. 246) has shown that the results by Ritthausen's method are "nearly, if not quite correct." It is probably the best method for condensed-milk analysis.

Milk-Sugar. — This was determined in most cases by treating 25 cubic centimetres of the filtrate just mentioned with 15 cubic centimetres of Fehling's solution (68 grams of caustic soda and 187 grams of tartrate of potassium and sodium in 500 cubic centimetres of water; 34.64 grams of copper sulphate in 500 of water; the two solutions being mixed at the time of using them combined as Fehling's solution) in a porcelain dish resting on wire gauze over a Bunsen burner. The contents of the dish were rapidly brought to boiling, and then boiled for four minutes, after which the liquid was filtered through a filter 6 centimetres in diameter, and the precipitated suboxide of copper was washed, chiefly by decantation in the dish, with about 40 cubic centimetres of water, which was also passed through the filter. As little of the precipitate as possible was brought on the filter. The filter was then dried and burned, the residue dissolved in a little nitric acid, this acid poured into the dish to dissolve the suboxide of copper, and the solution evaporated with a little sulphuric acid until all nitrous fumes were expelled. The solution was then diluted with water and the copper deposited electrolytically in a small platinum dish. Rodewald and Tollens (*Berichte*, xi. 2076) have shown, that, when milk-sugar is treated with Fehling's solution as above described, the weight of copper multiplied by 0.763 equals the weight of milk-sugar present. They worked with asbestos filters, and certainly the paper filter does retain a very little of the copper in the Fehling's solution; but a blank test showed that the filter used in these examinations of condensed milk retained only 0.0009 of a gram of copper; so that the above factor, 0.763, was used in calculating the results.

Cane-Sugar was obtained in every instance by deducting the weight of the remaining solids (milk solids) from the total solid residue of the dried milk.

General Observations.

The following tables, I. and II., give the results of analysis of the milks according to the method just described. The last column, headed 'Times condensed,' indicates the number of volumes of the original milk that were condensed to one volume. The figures in this column are obtained by dividing the figures representing the percentage of milk solids by 12.5, which is assumed as the average percentage of solids in the original milks. Hehner (*Analyst*, iv. p. 44) has calculated the condensation by dividing the percentage of milk solids not fat by 9.3, the assumed percentage of such solids in cow's milk. The figures thus obtained would differ in the case of our samples by less than 0.2 per cent in any instance. The percentage of fat in the original milk is naturally obtained by dividing the figures representing the percentage of fat in the condensed milk by those representing the condensation. Although No. 21 cannot be regarded as made from a milk originally very rich in fat, yet there is nothing to indicate that any of the samples were made from skimmed milk.

A word or two seems proper with reference to the proportions of fat and caseine. The average percentage of caseine in cow's milk is variously given by different authorities, but is probably about 0.4 per cent greater than that of fat, as the writer has calculated from figures representing a very large number of analyses given in the 'First Report of the New York State Dairy Commissioner,' p. 58. It was stated, moreover, by Wigner (*Analyst*, iv. p. 48) that some of the caseine was decomposed during the condensation of milk with sugar, and it would therefore seem that the percentage of caseine in average condensed milk should at all events not greatly exceed that of the fat. In the writer's analyses it falls slightly below. The caseine and albumen reported in many of the analyses quoted in the New York dairy commissioner's second report, pp. 152–154, are very largely in excess of the fat; exceeding it, for instance, in four out of many cases by the following figures respectively: 8.1, 6.07, 8.24, 7.72 per cent.

There seems to be but one explanation of such a result, and that is, that the condensed milks were made from partially skimmed milk, without regard to the fact that the percentage of fat actually present in the condensed milk may not be below the average.

Hehner (*loc. cit.*) found two samples of a certain brand of con-

densed milk with 11.73 and 11.34 per cent of caseine and 7.19 and 6.98 of fat, respectively, and calculated that they were made from milks containing originally 2.5 per cent of fat; but he hesitated to call them skimmed. Judged by the above standard, they give certain indications of being skimmed.

Hassall's analyses of condensed milk cited by Hehner show in general greater condensation than those in this paper, but the average percentage of caseine is 16.85; of fat, 10.27; and here, again, skimming is certainly to be suspected.

TABLE I.

Condensed Milk with Cane-Sugar.

No. of Sample.	Percentages.								Times condensed.
	Water.	Fat.	Caseine and Albumen.	Milk-Sugar.	Ash.	Cane-Sugar.	Milk Solids.	Fat in Original Milk.	
20	28.75	8.90	8.71	11.08	1.62	40.94	30.31	3.67	2.42
21	25.83	8.25	10.40	13.63	2.01	39.88	34.29	3.01	2.74
26	25.91	9.14	9.17	13.09	1.86	40.83	33.26	3.43	2.66
27	31.45	8.78	8.21	11.43	1.70	38.43	30.12	3.64	2.41
28	23.91	8.94	9.45	12.60	1.85	43.25	32.84	3.41	2.62
29	27.17	9.22	8.22	11.98	1.77	41.64	31.19	3.70	2.49
30	25.00	9.88	8.92	12.58	1.85	41.77	33.23	3.71	2.66
32	25.49	8.89	9.51	13.05	1.97	41.09	33.42	3.33	2.67
33	28.70	10 22	8.52	16.74	1.81	34.01	37.29	3.43	2.98
35	28.77	11.06	7.97	15.53	2.40	34.27	36 96	3.74	2.95
36	27.44	9.66	9.24	35.17*	1.82	16.67	-	-	-
37	29.83	11.17	10.07	15 44	2.31	31.18	38.99	3.59	3.11
38	23.45	11.14	12.20	13.78	1.99	37.44	39.11	3.57	3.12
41	25.63	10.54	8.89	13.06	1.89	39.99	34.38	3.83	2.75
Average..	26.95	9.69	9.25	13.38†	1.92	38.82†	34.26	3.54	2.74

*See 'Special Remarks,' below. † Excluding No. 36.

TABLE II.

Condensed Milk without Cane-Sugar.

No. of Sample.	Percentages.							Times condensed.
	Water.	Fat.	Caseine and Albumen.	Milk-Sugar.	Ash.	Milk Solids.	Fat in Original Milk	
34	63.25	10.72	10.08	13.79	2.16	36.75	3.64	2.94
40	64.09	9.35	11.75	12.68	2.13	35.91	3.25	2.87

The results given in the second New York report (*loc. cit.*) for condensed milk with sugar are as follows:—

	Average.	Minimum.	Maximum.
Water	25.43	15.45	30.08
Caseine and Albumen	12.15	8.20	18.96
Fat	10.78	5.96	17.01
Milk-Sugar	13.48	10.11	17.77
Cane-Sugar	35.89	-	-
Ash	2.27	1.62	3.62

The average amount of cane-sugar there given is lower than that in the milks analyzed by the writer, and the latter therefore contain, on the average, less milk solids, but among them are several milks of excellent quality. The percentages of fat and caseine are the most important, provided the milk be of good quality in other respects.

SPECIAL REMARKS.

The following details are of interest in connection with the analyses in Tables I. and II.:—

No. 21 was not in perfect condition; a little gas escaped on opening the can, and the milk was soon full of bubbles, caused by fermentation.

No. 27 contained a considerable amount of undissolved cane-sugar.

No. 33 was so stiff that it would not run out of the can, had a cheesy smell, curdled even when very slightly warmed with water, was of a brownish color, and altogether was of inferior quality.

No. 34 was apparently in good preservation, but the metal of the can was darkened inside, as if the tin had been attacked.

No. 36 was a dark brown, glutinous mass, with a smoky and cheesy taste and odor. Apparently molasses or glucose had been used in place of at least some cane-sugar in preparing it, as the result of the analysis indicates. The 35.17 per cent of 'milk-sugar' could not have been pure milk-sugar, and the figures really represent only a reducing power equivalent to that amount of milk-sugar.

No. 38 was quite stiff, of a brownish color, and had a somewhat cheesy smell.

No. 40 was not in perfect condition; the tin of the can was darkened inside, and gas escaped on opening the can. The caseine and albumen given in the table were calculated from the loss; an actual determination by Ritthausen's method gave 9.28 per cent of caseine.

The other milks, not especially mentioned above, were in good condition and well put up.

The percentage of ash of all of the milks, with the possible exception of No. 35, shows that the cane-sugar used was itself free from excessive ash.

H. B. CORNWALL.

Princeton, N.J., Sept. 14.

Chalcedonized Fossils.

A CURIOUS instance of the formation of rose chalcedony on fossils was called to my attention some time ago. The fossils were mostly specimens of species of *Monticulipora*, and often the whole surface was covered with the ring-like chalcedonic formation. The cells of the coral were in most cases still plainly seen, but the whole outer aspect of the fossil was so changed as to make me think for a time that it might prove to be an undescribed species.

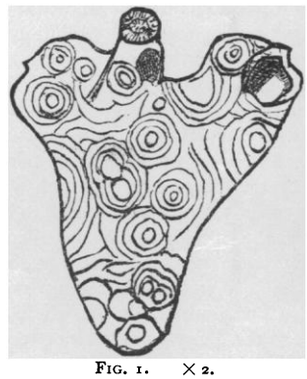


FIG. 1. × 2.

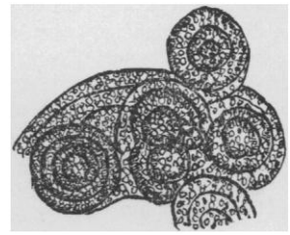


FIG. 2. × 4.

Fig. 1 shows the general appearance of one of the best specimens. Fig. 2 is an enlarged view of some of the rosettes. These corals are not the only ones having this peculiar feature, for certain specimens of *Streptelasma* present the same appearance. In many cases the rosettes are remarkably perfect, and in places the transition from the ordinary appearance to that of the chalcedonized surface is plainly seen.

JOSEPH F. JAMES.

Miami University, Oxford, O., Sept. 5.